

WHAT IS CLAIMED IS:

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1. An optical deflection apparatus that changes a reflection direction of an incident light flux, the optical deflection apparatus comprising:

a member including a light reflection region; and

10 an electret member that contributes at least in part to a generation of an electrostatic attraction force, the electrostatic attraction force subjecting the member including the light reflection region to at least one of a displacement and a deformation.

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2. The optical deflection apparatus as claimed in claim 1,  
20 wherein:

the electret member is arranged to be in contact with the member including the light reflection region; and

an electric potential difference between an electric potential of the electret member and an electric potential  
25 applied to an electrode that is set apart and substantially

opposite to the electret member causes at least one of a displacement and a deformation of the electret member and the member including the light reflection region.

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3. The optical deflection apparatus as claimed in claim 1, wherein the electret member and the member including the light reflection region are not electrically connected to an external potential.

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4. The optical deflection apparatus as claimed in claim 1, wherein the member including the light reflection region has a torsion beam configuration.

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5. The optical deflection apparatus as claimed in claim 1, wherein the member including the light reflection region has a cantilever beam configuration.

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5        6. The optical deflection apparatus as claimed in claim 1,  
wherein the member including the light reflection region has a  
dual side fixed beam configuration.

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7. An optical deflection apparatus that changes a  
reflection direction of an incident light flux, the optical  
deflection apparatus comprising:

15        a substrate;

         a plurality of regulating members having stoppers and  
being implemented at a plurality of edge portions of the  
substrate;

         a fulcrum member being implemented on the substrate;

20        a sheet member including a light reflection region and an  
electret member, and being movably disposed within a space  
created by the substrate, the fulcrum member, and the stoppers;  
and

         a plurality of electrodes being implemented on the  
25        substrate and arranged substantially opposite to the sheet

member;

wherein the sheet member is subjected to at least one of a displacement and a deformation by an electrostatic force generated with respect to the electret member and the electrodes.

8. The optical deflection apparatus as claimed in claim 7, wherein:

the fulcrum member is arranged to divide the substrate substantially in half;

the electrodes are arranged such that a first electrode is implemented on one side of the fulcrum member and a second electrode is implemented on the other side of the fulcrum member; and

a one-axis two-dimensional optical deflection is realized by tilting the sheet member around the fulcrum member.

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9. The optical deflection apparatus as claimed in claim 8, wherein:

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a first electric potential that is substantially equivalent to an electric potential of the electret member is applied to one of the first and second electrodes;

a second electric potential is applied to the other one of  
5 the first and second electrodes; and

the sheet member is tilted by switching between applying the first electric potential and the second electric potential to the first electrode and the second electrode.

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10. The optical deflection apparatus as claimed in claim 9, wherein the second electric potential corresponds to a  
15 ground potential.

20 11. The optical deflection apparatus as claimed in claim 7, wherein an inorganic material is used for the electret member.

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12. The optical deflection apparatus as claimed in claim  
11, wherein at least one of a metal oxide film, a metal  
oxinitride film, and a metal nitride film is used as the  
5 inorganic material.

10 13. The optical deflection apparatus as claimed in claim  
11, wherein a silicon oxide film is used as the inorganic  
material.

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14. The optical deflection apparatus as claimed in claim  
11, wherein a silicon nitride film is used as the inorganic  
material.

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15. The optical deflection apparatus as claimed in claim  
25 11, wherein an aluminum nitride film is used as the inorganic

material.

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16. An optical deflection apparatus manufacturing method,  
comprising the steps of:

forming a fulcrum member on a substrate;

forming a plurality of electrodes on the substrate;

10 depositing and planarizing a first sacrificial layer over  
the electrodes;

depositing an electret member on the first sacrificial  
layer;

15 charging the electret member to a predetermined electric  
potential;

depositing a member including a light reflection region on  
the electret member;

patterning the electret member and the member including  
the light reflection region to form a sheet member;

20 depositing a second sacrificial layer on the sheet member;

patterning the first sacrificial layer and the second  
sacrificial layer;

25 patterning a plurality of regulating members having  
stoppers to a position where the first and second sacrificial  
layers are patterned; and

removing the patterned first and second sacrificial layers  
through etching.

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17. The optical deflection apparatus manufacturing method  
as claimed in claim 16, wherein an inorganic material is used  
for the electret member.

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18. The optical deflection apparatus manufacturing method  
15 as claimed in claim 17, wherein at least one of a metal oxide  
film, a metal oxinitride film, and a metal nitride film is used  
as the inorganic material.

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19. The optical deflection apparatus manufacturing method  
as claimed in claim 17, wherein a silicon oxide film is used as  
the inorganic material.

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20. The optical deflection apparatus manufacturing method  
5 as claimed in claim 17, wherein a silicon nitride film is used  
as the inorganic material.

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21. The optical deflection apparatus manufacturing method  
as claimed in claim 17, wherein an aluminum nitride film is  
used as the inorganic material.

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22. An optical deflection array that is adapted to change  
a reflection direction of an incident light flux, the optical  
20 deflection array comprising:

an optical deflection apparatus including a member having  
a light reflection region, and an electret member that  
contributes to a generation of an electrostatic attraction  
force, the electrostatic attraction force subjecting the member  
25 having the light reflection region to at least one of a

displacement and a deformation; wherein

a plurality of the optical deflection apparatuses are laid out in at least one of a one-dimensional arrangement and a two-dimensional arrangement.

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23. An optical deflection array that is adapted to change  
10 a reflection direction of an incident light flux, the optical deflection array comprising:

an optical deflection apparatus including a substrate, a plurality of regulating members having stoppers and being implemented at a plurality of edge portions of the substrate, a  
15 fulcrum member being implemented on the substrate, a sheet member including an electret member and a light reflection region, and being movably disposed within a space created by the substrate, the fulcrum member, and the stoppers, and a plurality of electrodes being implemented on the substrate and  
20 arranged substantially opposite to the electret member, the sheet member being subjected to at least one of a displacement and a deformation by an electrostatic attraction force generated with respect to the electret member and the electrodes; wherein

25 a plurality of the optical deflection apparatuses are laid

out in at least one of a one-dimensional arrangement and a two-dimensional arrangement.

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24. An imaging apparatus that is adapted to form a latent image by conducting optical writing on a photoconductor, the imaging apparatus comprising:

10        an optical write unit including an optical deflection array that is adapted to change a reflection direction of an incident light flux, the optical deflection array implementing an optical deflection apparatus including a member having a light reflection region, and an electret member that  
15        contributes to a generation of an electrostatic attraction force, the electrostatic attraction force subjecting the member having the light reflection region to at least one of a displacement and a deformation, wherein a plurality of the optical deflection apparatuses are laid out in at least one of  
20        a one-dimensional arrangement and a two-dimensional arrangement.

25        25. An imaging apparatus that is adapted to form a latent

image by conducting optical writing on a photoconductor, the imaging apparatus comprising:

an optical write unit including an optical deflection array that is adapted to change a reflection direction of an incident light flux, the optical deflection array implementing an optical deflection apparatus including a substrate, a plurality of regulating members having stoppers and being implemented at a plurality of edge portions of the substrate, a fulcrum member being implemented on the substrate, a sheet member including an electret member and a light reflection region, and being movably accommodated within a space created by the substrate, the fulcrum member, and the stoppers, and a plurality of electrodes being implemented on the substrate, and arranged substantially opposite to the electret member, the sheet member being subjected to at least one of a displacement and a deformation by an electrostatic force that is generated with respect to the electret member and the electrodes, wherein a plurality of the optical deflection apparatuses are laid out in at least one of a one-dimensional arrangement and a two-dimensional arrangement.

26. An image projection display apparatus that is adapted

to display a projection image based on image information, the image projection apparatus comprising:

5 a display unit that reflects an optical signal from a light source in a desired direction according to the image information, the display unit including an optical deflection array that implements an optical deflection apparatus including a member having a light reflection region, and an electret member that contributes to a generation of an electrostatic attraction force, the electrostatic attraction force subjecting  
10 the member having the light reflection region to at least one of a displacement and a deformation, wherein a plurality of the optical deflection apparatuses are laid out in at least one of a one-dimensional arrangement and a two-dimensional arrangement.

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27. An image projection display apparatus that is adapted to display a projection image based on image information, the  
20 image projection apparatus comprising:

a display unit that reflects an optical signal from a light source in a desired direction according to the image information, the display unit including an optical deflection array that implements an optical deflection apparatus including  
25 a substrate, a plurality of regulating members having stoppers

and being implemented at a plurality of edge portions of the substrate, a fulcrum member being implemented on the substrate, a sheet member including an electret member and a light reflection region, and being movably accommodated within a space created by the substrate, the fulcrum member, and the stoppers, and a plurality of electrodes being implemented on the substrate, and arranged substantially opposite to the electret member, the sheet member being subjected to at least one of a displacement and a deformation by an electrostatic force that is generated with respect to the electret member and the electrodes, wherein a plurality of the optical deflection apparatuses are laid out in at least one of a one-dimensional arrangement and a two-dimensional arrangement.